



FINAL REPORT

Part 1 - Summary Details

Cotton CRC Project Number: 5.01.28

Project Title: Delivering Regional Extension in Qld
Farming Systems – Darling Downs

Project Commencement Date: 1-07-2009 **Project Completion Date:** 30-6-2012

Cotton CRC Program: The Adoption

Part 2 – Contact Details

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Part 3 – Final Report Guide (due at 31st May 2012)

(The points below are to be used as a guideline when completing your final report.)

Background

1. Outline the background to the project.

The Darling Downs Regional Cotton Extension Officer position is part of the cotton industry development and extension program carried out by the Queensland State Government Department of Agriculture, Fisheries and Forestry (DAFF, formerly DEEDI), Crop and Food Science Unit –. The position is jointly funded through the Cotton CRC, Cotton Research and Development Corporation and DAFF Qld.

Extension plays a key role in the uptake of research and the adoption of best practice within the cotton industry, maintaining highly productive and sustainable farming systems. This project continues the collaboration between DEEDI and the Cotton Catchment Communities Cooperative Research Centre (Cotton CRC) delivering regional / local outcomes within a national framework as well as national extension initiatives.

The objective of the project is to develop, adapt and promote the adoption of industry research and achieve “on-ground” outcomes relevant to Darling Downs cotton farming systems. This principally involves the development of participative learning processes with growers, consultants and service providers and includes meetings, workshops, field days, on-farm trials, demonstrations, Decision Support System tools, publications and media releases.

The project was developed following the Cotton CRC, CRDC, DEEDI review of extension services in the Darling Downs Border Rivers Region in 2009 conducted by Ewan Colquhoun.. It was designed to better understand the needs of mixed enterprises (cotton, grain, grazing) related to resilient farming, to identify opportunities for farming system collaboration, and to assess the need for specialist extension services

The role Regional Cotton Extension Officer changed from a regionally focused position, linked into the National Extension team to a national focused role in “Crop Nutrition and Soil Health”. The role, while still being part of the national extension team and having regional responsibilities, focused on the facilitating the adoption of best practice and research outcomes for the specific target area.

Following the establishment of the Industry Development and Delivery Team by Cotton CRC and CRDC, this project assumed responsibility for the Nutrition and Plant Health Target leadership.

Objectives

2. List the project objectives and the extent to which these have been achieved.

The Regional Extension Officer will work with producers, service providers, industry and partner organisations to achieve “on-ground” outcomes through the

development of collaborative activities and partnerships. The officer will identify and facilitate the adoption of industry best practice, in addition to developing networks and building industry capacity to improve viability, increase profitability and maintain sustainability of the cotton industry.

This will require the officer to communicate and collaborate extensively with a range of stake holders and form a central link between research and extension staff, industry specialists, regional Cotton Grower Associations, industry bodies and cotton producers. The officer will undertake, facilitate and coordinate a range of research, extension and training activities in conjunction with key industry team members and stakeholders to achieve on-ground outcomes and the adoption of emerging technology.

Objective 1.

Implement a regional participatory extension and adoption plan focussed on the delivery and industry uptake of emerging technologies and management strategies which contribute to increased productivity, profitability and sustainability of Cotton Farming System.

- Conduct on farm trials, demonstration, validation and adaptation of emerging research trials to regional scale.
- Coordinate field days / farm walks / updates to address regionally relevant and topical issues.
- Use of relevant national and regional/local media to highlight research outcomes and/or extension activities.
- Technical information support for assisting with regional or national issues. (Cotton Tales)
- Delivery and support of industry programmes (eg. BMP, IPM, IRMS).

Objective 2.

Extension programs aligned with the needs of key stakeholders.

- Foster linkages between local industry, researchers and Cotton CRC partners.
- Incorporation of local priorities and adaptation of emerging research into regional extension strategies.

Objective 3.

Within the Cotton CRC Adoption Programme actively participate as a member of the National Development and Delivery (D & D) Team and Priority Teams, to deliver focussed information and knowledge to industry.

- 50% of ha compliant with industry best practice as defined by the BMP guidelines for soil health practices
- 50% of ha compliant with industry best practice as defined by the BMP guidelines for crop nutrition practices
- 70% of ha utilising objective measurements to adjust nitrogen application

Objective 4.

Identify and evaluate outcomes and impacts of regional extension programme.

- Conduct evaluation programmes to measure the impacts and outcomes of extension activities.

Methods

3. Detail the methodology and justify the methodology used. Include any discoveries in methods that may benefit other related research.

This project worked at both a local and a national level using a knowledge management system to delivery adoption and extension programs to growers and industry service providers. During the project the extension officer communicated and collaborated extensively with a wide range of stakeholders to develop a central link between researchers and extension staff, industry specialists, regional grower associations, industry bodies, service providers and producers.

The adoption and extension program used participative learning processes such as workshops, meetings, field days, farm walks and on-farm trials and demonstrations to achieve on-ground outcomes and the adoption of emerging technology and best practice. This was supported by publications, tech notes, published articles decision support systems (DSS) and tools.

The establishment of a very close collaboration between the extension officer, the growers and the crop consultants played a critical role in enabling the successful transfer of information between all parties. This relationship allowed extension officer to rapidly respond to challenges that developed within the region and provide the technical support required.

Results

4. Detail and discuss the results for each objective including the statistical analysis of results.

Objective 1.

Implement a regional participatory extension and adoption plan focussed on the delivery and industry uptake of emerging technologies and management strategies which contribute to increased productivity, profitability and sustainability of Cotton Farming System.

- *Conduct on farm trials, demonstration, validation and adaptation of emerging research trials to regional scale*

The principal focus of the project has been plant nutrition and soil health issues. Nitrogen use efficiency, and the development and validation of a NUE seed test was the main focus although significant effort was put into P, K and S research and the use of soil organic amendments.

Regional and industry wide nitrogen use trials were conducted to provide supporting data for nitrogen use efficiency research conducted by Dr Ian Rochester. Validation and demonstration trials for the fuzzy seed nitrogen use efficiency tool developed by Dr Ian Rochester were also undertaken. Results from these trials helped identify the level of nitrogen use efficiency throughout the industry, providing supporting information for the promotion and adoption of production systems and of more efficient use of nitrogen was promoted throughout the industry.

In conjunction with several service providers, a large scale soil organic amendment trialling program has been established. Five trial sites have been established 3 of which are in cotton production systems. Six different amendments are being examined over a 5 year program. Soil health and crop nutrition as well as long term sustainability of these types of production systems and their economic viability will be measured.

Several P and K farmer trials were undertaken. The 2010-11 trials were lost due to flooding and results from 2011-12 are yet to be analysed.

Outcomes: Results from the nitrogen work have been included in the national research and presented by Dr Ian Rochester. The Fuzzy seed validation trials are yet to be analysed and presented but early indication are promising. First results from the organic amendment trials are yet to be analysed.

Impact: Trial work has provided the information which clarifies nitrogen use efficiency. Survey results indicate that there is a strong awareness of the importance managing nitrogen and nitrogen inputs. These survey results indicate that:

- 85% of growers and 100% of consultants are using soil test to calculate crop nutrient requirement.
- 82% of consultants and 55% of growers are using leaf and petiole testing to monitor crop nutrient demand during crop growth.
- Growers are also using nutrient removal rates, fertilizer efficiencies and losses, targeted yields, block history and cropping systems to manage fertilizer rates.
- 45% of growers surveyed are split applying their N.

Growers at field walks have indicated that they are very interested in the outcome of the organic amendment trial program.

- *Coordinate field days / farm walks / updates to address regionally relevant and topical issues.*

Field days, farm walk and grower meetings played a pivotal role in engaging with growers, consultants and service providers both on a local and industry wide basis. They were used for a number of key roles:

- Provide direct technical information by scientists, extension and specialists on specific topic and regional issues as they develop. ie Cotton Bunchy Top and Mealy Bug

- Provide direct technical information by scientists, extension and specialists on core topic areas i.e. crop nutrition and soil health presentations at grower meetings, CCA and GRDC meetings Nitrogen Use Efficiency, Nitrogen losses following flooding. P, K & S placement.
- Demonstrate research outcomes, new technology and varieties. I.e Nitrogen Use Efficiency Trials, P,K & S research trials, soil pits,
- Provide support to growers i.e. following flooding, social and mental health support
- Promote industry support tools i.e. CottASSIST, Australian Cotton Production Manual, Symptoms Guide etc
- Gain industry feedback and information on grower and regional issues.

Use of relevant national and regional/local media to highlight research outcomes and/or extension activities

Media was used for a number of reasons and on a number of levels.

- Promote upcoming field days, workshops and presentation. For example it was used extensively to promote the flood recovery information days (6 locations) following the floods in 2011.
- Raise awareness of issues that could impact the industry. For example the spray drift awareness campaign in 2011 which used both the printed media and local TV news.
- Respond to issues raised by the industry or wider community. For example the Mealybug outbreak in CQ and possible impact or incursion onto the Darling Downs.

A list of the main media releases and highlights are listed in Section 9:

Publications

- *Technical information support for assisting with regional or national issues. (Cotton Tales)*

28 Cotton Tales for the Darling Downs and 19 Cotton Tales for the Border Rivers were produced and distributed to growers, consultants and service providers. These technical papers promoted new research and best practice and provided regional based information on emerging issues. Cotton Tales are produced in collaboration with relevant scientists to provide the latest information and management practices on regional issues as they arise. They play a critical role in meeting grower concerns quickly and timely.

Day Degree Accumulation and Evapotranspiration spreadsheets and accumulative graphs were developed and distributed to growers, consultants and service providers on a regular basis throughout 2010-11-12 season. This provided the accumulative day degree accumulations for 21 weather stations across the Downs and the daily ET's for the previous week. This information allowed consultants and

growers to monitor the growth stages of their crops and provided valuable information for irrigation scheduling.

- *Delivery and support of industry programmes (eg. BMP, IPM, IRMS).*

Throughout the project significant developmental support and promotion was provided to the myBMP program. Technical input and review of the crop nutrition, soil health and carbon modules were undertaken. The program was supported and promoted at grower meetings and field days and Duncan Weir has been appointed as the nutrition enquiry contact in myBMP.

Adherence to the IRMS, Bollgard II RMP and IPM has been promoted through Cotton Tales, media and grower meetings. Technical support was provided to the growers association with reference to the planting window, its timing and applications to TIMS for planting window variations.

Objective 2.

Extension programs aligned with the needs of key stakeholders.

- *Foster linkages between local industry, researchers and Cotton CRC partners.*

Throughout the project significant effort has been made in developing close working relationships with all key stakeholders within the cotton industry across Darling Downs. This starts at a grower level attending all grower associations meetings at which the extension officer reported on developing industry issues, new research and research outcomes, governmental initiatives and acted as the contact between the growers and the Darling Downs Crop Consultants. The extension officer gathered feedback from growers and other relevant issues and relayed them back to researchers. Similarly, the extension officer attended all local crop consultant meetings, providing a similar service.

The extension officer has developed strong relationships and interactions with many researchers across a wide variety of disciplines. This has facilitated the development of a significant level of collaboration between all parties. Support to visiting researchers, technical infield support and assistance, regional intelligence, identifying potential local collaborators, data collection and surveys, organising workshops and meetings are some of the outcomes.

Linkages and collaboration with other important industry partners have also been established. Working closely with Cotton Australia representatives and CSD has facilitated an increased level of information flowing between the growers, service providers and the industry representatives and has ensured a more co-ordinated approach.

Outcome: The extension officer has increased the flow of information between all key stakeholders and facilitated an increase in the capacity of research undertaken and extended across the Downs

- *Incorporation of local priorities and adaptation of emerging research into regional extension strategies.*

During the period of the project three major issues (mealybug, Cotton Bunchy Top (CBT), and flooding) have impacted on growers on the Downs. The extension officer co-ordinated researchers and specialists to provide support and technical information to growers as these issues developed and impacted on the growers.

Outcome: Strategies were implemented to meet these challenges. Mealybug have been contained in the central Queensland region and have not established themselves on the Downs. CBT strategies including control of regrowth and ratoons, maintaining good IPM programs and farm hygiene has significantly limited the economic impact of the disease on crops. The impact of the extensive flooding has been ongoing, however, the social support provided to the communities and on going technical support around crop nutrition and soil health has had significant impacts.

Objective 3.

Within the Cotton CRC Adoption Programme actively participate as a member of the National Development and Delivery (D & D) Team and Priority Teams, to deliver focussed information and knowledge to industry.

- *50% of ha compliant with industry best practice as defined by the BMP guidelines for soil health practices*
- *50% of ha compliant with industry best practice as defined by the BMP guidelines for crop nutrition practices*
- *70% of ha utilising objective measurements to adjust nitrogen application*

Objective 4.

Identify and evaluate outcomes and impacts of regional extension programme.

- *Conduct evaluation programmes to measure the impacts and outcomes of extension activities.*

An industry wide bench marking survey was conducted in 2010 to evaluate soil health and crop nutrition management practices. Results from this survey reinforced much of the information generated through the annual Crop Consultant Survey. A summary of results from this survey was presented at the 2010 Cotton CRC science forum and is attached to this document.

Cotton CRC Target Reporting: 5.01.28 Delivering regional extension in Queensland farming systems – Darling Downs and Border Rivers

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| Target | <i>Place target here</i> 50% of ha compliant with industry best practice as defined by the BMP guidelines for soil health practices. |
| Current level of usage | Activity uptake plus Industry Data (Completed every 6 months) 85% of surveyed growers are developing and implementing soil health / crop nutrition management plans. Growers are incorporating crop rotations, minimum / conservation tillage, GPS guidance systems, permanent beds and yield mapping in their management plans. (Weir 2010 Grower Survey, GHD Hassall 2010-11 Grower Survey) |

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| Target | <i>Place target here</i> 50% of ha compliant with industry best practice as defined by the BMP guidelines for crop nutrition practices. |
| Current level of usage | Activity uptake plus Industry Data (Completed every 6 months) Survey results indicate that 81% of growers (Hassall 2010-11 Grower Survey) and 100% of consultants (CCA Survey 2010) are using soil test to calculate crop nutrient requirement. 82% of consultants and 38% of growers are using leaf and petiole testing to monitor crop nutrient demand during crop growth. They are also using nutrient removal rates, fertilizer efficiencies and losses, targeted yields, block history and cropping systems to manage fertilizer rates (Hassall 2010-11 Grower Survey). 85% of surveyed growers are developing and implementing soil health / crop nutrition management plans (Weir 2010 Grower Survey) |

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| Target | <i>Place target here</i> 70% of ha utilizing objective measurements to adjust nitrogen applications. |
| Current level of usage | Activity uptake plus Industry Data (Completed every 6 months) Survey results indicate that 81% of growers (Weir 2010 Grower Survey, GHD Hassall 2010-11 Grower Survey) and 100% of consultants (CCA Survey 2010) are using soil test to calculate crop nutrient requirement. 82% of consultants and 38% of growers are using leaf and petiole testing to monitor crop nutrient demand during crop growth. They are also using nutrient removal rates, fertilizer efficiencies and losses, targeted yields, block history and cropping systems to manage fertilizer rates. 45% of growers surveyed are split applying their N. (Weir 2010 Grower Survey, GHD Hassall 2010-11 Grower Survey). |

| | Activities undertaken (brief description and numbers attended) | Outputs (fact sheets/resources created for workshop) | Activity uptake (results of M&E no. of growers that have changed etc) |
|---|--|---|---|
| 1 | Crop Nutrition and Soil Health | | |
| | <ul style="list-style-type: none"> • Soil & tissue testing Post Flooding <ul style="list-style-type: none"> ○ Extensive soil and leaf to determine impact (short and long term) on soil health and nutrition • P K and S Farmer Trials <ul style="list-style-type: none"> ○ Facilitated and monitored farmer strip trials ○ Engaged with research program providing support and co-ordinating extension activities • Soil Organic Amendment Trials <ul style="list-style-type: none"> ○ In conjunction with various different industry organizations, interested growers and service providers, assisted in the developed and establishment of a series (5 trial sites) Soil Organic Amendment Trials. These trials are to be conducted over a 5 years period and measure the impact and economic value of using organic amendments in cotton production systems. 2 trials have been established in cotton systems and a further 3 in grain systems | <p>Information used in presentations and field walks and grower meetings including Cecil Plains Grower Field day, Crop Consultants Seminars, Darling Downs Cotton Growers Meeting, Darling Downs Crop Consultants Meeting,</p> <p>Facilitated extension presentations by scientists to grower meetings, field walk and work shops</p> <p>Trial began in the 2011-12 season and ist years results are yet to be processed.</p> | <p>Information presented to growers, consultants and service providers throughout Queensland and Northern NSW growing areas. Understanding and appreciation of the nitrogen losses, other nutritional deficiencies and soil health impacts.</p> <p>Broader understanding of growers and consultants on P,K and S in cotton systems.</p> |

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| | <ul style="list-style-type: none"> • Soil Health and Crop Nutrition Discussion Group <ul style="list-style-type: none"> ○ Facilitated the establishment of a work group (scientists and extension officers) to discuss soil health and crop nutrition research and related issues. ○ Facilitated the Cotton CRC Soil Health and Crop Nutrition Science review meeting and Carbon in Cotton Review meeting. • Cotton Seed NUE Validation Trials <ul style="list-style-type: none"> ○ Establish 6 trial sites in Griffith, St George and the Darling Downs to validate the use and application of a cotton seed testing tool in Nitrogen management and the calculation Nitrogen use efficiency within cotton systems | <p>Reviewed Carbon module within the myBMP program. Identified areas of need and further research</p> <p>Results yet to be processed</p> | |
| 2 | <p>Regional</p> <ul style="list-style-type: none"> • Flood Recovery 2011 & 2012 <ul style="list-style-type: none"> ○ Flood recovery meetings :Facilitated meetings across the Darling Downs (6 meetings) providing detailed information on assistance and services available to growers and small business following the floods : Involved QRAA, Centre link, DOC's, Tax Department, Lifeline, Local Government, and State Government reps and Qld Agricultural Minister ○ Flood recovery planning meeting with DDCGA, Ag Force , DD Irrigators Association ○ Warra and surrounding district flood "Rest and Recovery" meeting attended by approximately 150 growers and their families | <p>Contributed input into a extensive information support portfolio detailing all relevant services, support programs and information available to growers following the flooding.</p> <p>Provided resources, support and input into meetings</p> | <p>400 growers and small business owner provided support</p> <p>270 growers and families provided support and information during the recovery period.</p> |

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| | <ul style="list-style-type: none"> ○ Cecil Plains “Moving On” grower night attended by 120 growers and their families. ○ Ministerial Meeting DDCGA and Consultants meeting with State Minister For Agriculture : Provided input into a meeting with the minister outlining the impact of the flooding, ongoing water logging and identified areas of assistance for growers the State Government could provide. Toured impacted farms in the Millmerin / Cecil Plains area. ○ Flood recovery meeting 2012 Roma and Mitchell <ul style="list-style-type: none"> ● Industry Meetings <ul style="list-style-type: none"> ○ Participated and contributed to the following Cotton Industry forums and meetings including REF Com, IPM Forum and field days, CCA annual forums, Fuscom meetings, GRDC updates, ○ Darling Downs Grower Association and Crop Consultants Meetings ○ Darling Downs Cotton Grower Awards ○ D&D National Extension team meetings <ul style="list-style-type: none"> ● Shed Meetings, Field Day <ul style="list-style-type: none"> ○ Annual Cecil Plains Grower group field walk discussing Darling Downs Regional nutrition trialing program and impact of flooding on soil and crop health. Attended by growers, consultants and service providers ○ Cotton Trade Show Moree ○ Griffith Cotton Trade Show | <p>Provided regional support information</p> <p>Provided information tech notes and trial results</p> <p>Presentation on nutrient management in cotton</p> | <p>Understanding at a State Government level of the impact of the flooding on the Darling Downs and regional support needed</p> <p>Attended annually by over 50 growers, consultants and service providers</p> |
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| | <ul style="list-style-type: none"> ○ Australian Cotton Conference : Hands on Research session ○ Mental Health workshops for growers and consultants ○ Big Day Out Field Day. Cotton Industry Innovator of the Year Field Day and farm walk A industry wide field day promoting farm innovation and production systems. Lead a question / answer discussion examining crop nutrition and the sustainability of the production system developed by the grower. Focus on nitrogen, nitrogen efficiency and the use of tools to measure nitrogen use efficiency. ○ . | <p>Promotion of sustainable cropping and cropping systems and the delivery of technical information that can be applied to their individual farming enterprises in particular around nitrogen</p> | <p>Over 120 growers and industry representatives attended the field day.</p> |
| Other Core Areas | | | |
| 3 | <ul style="list-style-type: none"> ● Cotton Bunchy Top <ul style="list-style-type: none"> ○ Facilitated Cotton Bunchy Top and Aphid consultancy field walks and management planning workshop to discuss the spread of and impact of CBT on the Darling Downs and develop up a program to manage the disease into the future. Attended by 18 consultants and 6 DEEDI and CSIRO scientists ○ Cotton Bunchy Top Surveys : Conducted 2 surveys across the Downs to gauge the level of CBT late in the crop and the level of re-growth and ratoons still present prior to planting ● Flood Recovery Shed Meetings <ul style="list-style-type: none"> ○ 6 Cotton grower shed meetings (80 growers & | <p>Provided assistance in the development of a Tech Note on CBT to be distributed industry wide.</p> <p>Cotton tale articles and media releases promoting farm hygiene and control of regrowth and ratoon cotton</p> | <p>No obvious economic impact in 2012 when compared to 2011</p> <p>Significant reduction in ratoon and volunteer cotton plants.</p> |

consultants) discussing crop management following flooding and water logging: Mike Bange and Nilantha Hulugalle provided extensive technical support and Andrew Watson addressed marketing and Bollgard RMP issues.

- **CotASSIST Workshops**

- Demonstrating to growers on line web management tools focusing on NutriLOGIC

- **Mealy Bug Incursion**

- Grower meetings and field days to discuss the outbreak of mealy bug, possible impacts, control measures and management plans for the Darling Downs
- Regional surveys to measure extent of outbreak
- Media interviews and releases providing updates and information to growers and the wider community

In field discussions with growers and consultants on crop management following flooding and water logging.

Handouts providing information supporting the workshop

10 consultants and 3 growers trained in the use of CotASSIST

Outcomes

5. Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

This project has developed collaborative partnerships and extension activities to facilitate the adoption of industry best practice in addition to developing networks and building industry capacity to improve profitability and sustainability. In conjunction with this the Regional Extension Officer role transitioned to focus on delivering outcomes in target lead areas as part of the Development and Delivery Team.

This project has:

- Established strong linkages and collaboration between growers, consultants, researchers, servicer providers and industry representatives and government.
- Provided extensive industry support during and after devastating regional flooding
- Provided industry wide information and support on the impacts of flooding on crop nutrition and soil health. Widely promoting the impact on soil nitrogen levels and the need to soil test and manage crop nitrogen.
- Provided input into industry information products and tools including the Pest Management Guide, Australian Production Manual, Symptoms Guide and myBMP program.
- Implemented and developed regional programs for the management and control of Cotton Bunchy Top and Mealy bug.
- Re- established a soil health and crop nutrition working group.
- Promoted soil and tissue testing and the use of Nutrilogic as a critical management tools in cotton production.

Conclusion

6. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

Over the period of this project the following key impacts have been delivered.

- Re-established confidence in the industries regional extension capacity to support the industry,
- Supported the industry through a extremely difficult period following extensive flooding by providing technical information and social support,
- Elevated the importance and increased the awareness of soil health and crop nutrition as a critical management component in cotton production,
- Increased industry awareness of nitrogen use efficiency

- Established and coordinated the cotton soil health and crop nutrition work group

Extension Opportunities

7. Detail a plan for the activities or other steps that may be taken:
 - (a) to further develop or to exploit the project technology.
 - (b) for the future presentation and dissemination of the project outcomes.
 - (c) for future research.
 - Fuzzy Seed Nitrogen Use Efficiency Testing Tool: Identifying where this valuable technology fits into needs to be evaluated and promoted through case studies and the use of validation trials conducted over the past season.
 - Nitrogen Use Efficiency (NUE) adoption needs to continue especially in new production regions such as the MIA.
 - Recent responses in farmer strip to other nutrients including phosphorous, potassium, sulphur and boron need evaluated and incorporated into the valuable research presently being undertaken.
 - The organic amendment trials program have the potential to provide a real understanding of where composts and manures fit into cotton production systems. In particular, the impact on soil health and crop nutrition as well as the long term sustainability of these types of production systems and their economic viability.

Publications

8. A. Publications relevant to this project.

- B. All other publications by project team during this period.
 - World Cotton Conference : “A National Focussed Industry Program Delivering Best Practice Management in Australia” joint author with Susan Maas
 - Australian Cotton Grower 12 Regional Reports 2009-2012
 - Cotton Pest Management Guide : Weeds Module 2009, 2010
 - Australian Cotton Production Manual : Soil Health and Crop Nutrition Module 2010, 2011
 - 28 Cotton Tales Darling Downs
 - 19 Cotton Tales Border Rivers
 - Crop Notes: Cotton CRC Crop Notes Update
 - Petiole Sampling
 - Leaf Sampling
 - Nutrient Sampling in Cotton : Benefits & Limitations
 - Responding to late season flooding (contribution)
 - Summer Crop Fertiliser News Incitec Pivot: “ Darling downs survey shows impact of 2011 flooding”

- Spotlight (www.crdc.com.au)
 - Winter 2011 “Challenges for post flood field management”
 - Winter 2011 “Take time to know your soil”
- Update July 2011 The Australian Cotton Industry Development and Delivery Team : “Soil Health and Crop Nutrition”

Presentations (conference, field days, workshops etc)

- CCA Meeting 8-5-2012: “Short and long term impacts of flooding – some observations, soil chemistry and plant physiological responses”
- GRDC Warra update: “ Darling Downs soil nutrient survey following 2011 flooding: Impact and Outcomes” 23-8-2011
- Southern Cotton Expo: “Cotton Nutrition A General Overview” 29-11-2011
- 2010 Cotton CRC Science Forum: “Crop Nutrition, Soil Health, Soil Management”
- 2012 Cotton CRC Science Forum: “Crop nutrition and Soil Health Review”
- 2011 Flood Response Forums Darling Downs: Warwick, Chinchilla, Dalby, Goondiwindi, Pittsworth, Cecil Plains
- 2012 Flood Response Roma and Mitchell: “Flood impacts and Regional Support Services”

C. Have you developed any online resources and what is the website address?

- Reviewed and updated the DAFF Queensland online Cotton Nutrition Module. http://www.daff.qld.gov.au/26_4002.htm

D. Media interviews and releases

- Dalby Herald : Cotton Bunchy Top
- Chinchilla Times : “CBT potential threatens farmers” 13-10-11
- Spray Drift
 - WIN News Toowoomba (Toowoomba)
 - WIN News - 25/11/2010 - 06:39 PM Samantha Heathwood
 - Stanthorpe Border Post 23 Nov 2010 p15
 - Rural Weekly insert 26 Nov 2010 p1
 - Queensland Country Life 25 Nov 2010 p35
 - On Our Selection News 25 Nov 2010 p7
 - Daily News 23 Nov 2010 p11
 - Oakey Champion 1 Dec 2010 p10
 - Clifton Courier 1 Dec 2010 p 5

- <http://www.australiannews.com.au/australia/queensland/darlingdowns/toowoomba/story?cityid>
- Mon 22 November 2010
- Border News 6 Dec 2010 p4
- South Burnett Times: “Mealybug concerns confirmed” 20-1-12
- Queensland Country Life: “Floods depletes Down’s nitrate levels” 15-9-2011
- Queensland Country Life Interview: “Impact of flooding across Darling Downs” 11-2-11
- Rural Weekly: “Rain brings highs and lows for farmers” 19-9-2010
- ABC Western Queensland (Longreach) 12:30 News - 10/01/2012 “ Mealybug in the Downs region”
- Warwick Daily News 25 October 2010: “Mixed bag for southern Downs farmers”
- WIN News Rockhampton 12 January 2012: “Mealybugs”

Part 4 – Final Report Executive Summary

Provide a one page Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.

This project has delivered on two key areas. The first, providing a regional extension focus delivering cutting edge, emerging research information, extension support and information on major production issues and the promotion and adoption of best practice to growers, consultants and industry service providers. The second key area of delivery, focuses delivering national outcomes in the target lead area of soil health and crop nutrition in cotton production systems.

This project has established strong linkages and collaborations between growers, consultants, researchers, servicer providers and industry representatives and government allowing the unhindered flow of information between all key stakeholders. This has successfully delivered information and support on issues including, but not restricted to, crop nutrition, soil health, mealybug, Cotton Bunchy Top, IPM, fusarium, , compaction, waterlogging and government support programs. The project supported the development, implementation and adoption of national programs particularly the industry Best Management Practice program, myBMP. It o provided input into industry information products and tools including the Cotton Pest Management Guide, Australian Cotton Production Manual and Symptoms Guide.

Having a national focus on Soil Health and Crop Nutrition, the project promoted importance and increased the awareness of soil health and crop nutrition as a critical management component in cotton production. The re-established soil health and crop nutrition working group, nitrogen management and nitrogen use efficiency, the promotion of soil and tissue testing, P, K and S research, carbon in cotton systems and the use of Nutrilogic as a critical management tools were all part of the industry wide program supporting and assisting growers in achieving a sustainable viable cotton industry.

The success of this project has played its role in overall success of the Cotton Development and Delivery Team supporting the Cotton Industry during a very difficult period for the industry as a whole.

